# TOM Application Note

*Mobile Services: Performance Management and Mobile Network Fraud and Roaming Agreement Management*

**GB910B**

*Public Evaluation Version 1.1* *September 2000*

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# Acknowledgments

This TOM Addendum GB910B, “Mobile Services: Performance Management and Mobile Network Fraud and Roaming Agreement Management Application Note” is a much appreciated contribution of the TM Forum Mobile Management team, specifically Dr. Steffen Weichselbaum, Mannesmann Mobilfunk. The TeleManagement Forum would like to thank Steffen. We truly appreciate the sharing of his experience and expertise, but also his time in developing the base contribution. We would also like to thank Don Batosrky, Telcordia Technologies for his inputs to set the stage for this Application Note. We apologize to any person or organization we inadvertently missed in these acknowledgments.

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# About TeleManagement Forum

The TeleManagement Forum is an international non-profit organization serving the communications industry. Its mission is to help service providers and network operators automate their business processes in a cost- and time-effective way. Specifically, the work of the TM Forum includes:

- Establishing operational guidance on the shape of business processes
- Agreeing on information that needs to flow from one process activity to another
- Identifying a realistic systems environment to support the interconnection of operational support systems
- Enabling the development of a market and real products for integrating and automating telecom operations processes

The members of TM Forum include service providers, network operators and suppliers of equipment and software to the communications industry. With that combination of buyers and suppliers of operational support systems, TM Forum is able to achieve results in a pragmatic way that leads to product offerings (from member companies) as well as paper specifications.

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# About this Document

TOM Application Notes can be viewed as companion documents to the TOM. TOM Application Notes document specific applications of the Telecom Operations Map, including:

- Review and/or process flows for a specific service
- Review and/or process flows for a specific family of services
- Review and/or process flow for a specific sub-process or set of process activities
- Example generic process flows
- Explanatory or definitional information
- Supporting information on approaches to Process Design, Development and Management
- Etc.

The Telecom Operations Map provides a process framework for operations management. Service providers design and implement their business processes according to their business vision, mission, target customer requirements and their strategies. Application Notes are not prescriptive, but rather are example applications of using the TOM. This is because each service provider designs and develops their processes somewhat differently. Application Notes will be used as one way to assure that the TOM framework is viable for a specific need or a specific set of services, etc. An Application Note may detail special considerations, sub-processes or issues.

## This Application Note

This document depicts a view of TOM for Performance Management and describes Fraud and Roaming Agreement Management special considerations from a Mobile Services perspective. The Telecom Operations Map is readily applied to Mobile/Wireless Services. However, the TOM does not address in any detail Fraud or Roaming Agreement Management and this is a crucial priority for Mobile/Wireless Services.

This Application Note was also developed to show one approach to process decomposition, to solicit input on Performance Management, so that member dialog would be initiated on a consolidated TM Forum view of Performance Management interfaces and use cases. In addition, it is meant to start a dialog on Fraud and Roaming Agreement Management across TM Forum members. The priority for support and automation of these processes will become increasingly critical for all

networks, if not already a crucial priority. While the Application Note contains sufficient information to be a "standalone" document for individuals that know the TOM, it is much better to read it with the Telecom Operations Map as a reference.

It is expected that this document will be used to:

- Expand TOM coverage of Fraud and Roaming Agreement Management across all service families
- Develop more detail on Fraud and Roaming Agreement Management for Mobile Services and all service families as applicable
- As input to process modeling in the TM Forum Process Modeling Tool
- Develop a consolidated view of Performance Management Use Cases and interfaces
- Initiate or input to a catalyst project

The purpose of the TOM is to continue to set a vision for the industry for competing successfully through the implementation of process driven approaches to operations management. This includes ensuring integration and automation among all vital operations support systems concerned with service delivery and support. The focus of the Telecom Operations Map document is on the business processes used by service providers, the linkages or information flows between these processes, the identification of interfaces, and the use of Customer, Service, Network, and other information by multiple processes.

In summary, TOM Application Notes support the objectives of the TOM by providing application examples to further understanding of an area or application and to verify the viability of the TOM framework. Excellence in Performance Management and in the management of Roaming Agreements and Fraud is essential to future networks. These examples are strong seeds to drive work of the TM Forum TOM team and other working teams.

## Document Life Cycle

The "Mobile Services: Performance Management and Mobile Network Fraud and Roaming Agreement Management Special Considerations Application Note" is being issued as Evaluation Version 1.0. The TeleManagement Forum ("TM Forum") expects to update it to reflect:

- Comments from implementation experience
- Additional member comment and public comment
- Enhancements or companion documents based on work currently in progress in the TM Forum

The purpose of an Evaluation Version is to encourage input based on experiences of members and the public as they use the document. Following the Evaluation Period,

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documents that are seen to deliver value, especially based on implementation experience, are candidates for formal approval by the TM Forum. All documents approved by the TM Forum (as well as those previously approved by NMF) undergo a formal review and approval process.

This document will continue under change control. Supporting work will be issued as companions or appendices to this document. A document of this type is a "living document," capturing and communicating current knowledge, views and practices. Further inputs will be made because of detailed work ongoing in the TM Forum and the industry.

Individuals or companies who are not members of the TM Forum are encouraged to provide comments on this document. However, in order for their comments to be considered, a signed waiver must be on file with TM Forum pertaining to intellectual property rights. To obtain this form, please contact the TM Forum.

## Time Stamp

Evaluation Version 1.1 of TOM GB910B Application Note, "Mobile Services: Performance Management and Mobile Network Fraud and Roaming Agreement Management Application Note" can be considered valid until July 2001. At that time it will be updated, extended, incorporated with other work or retired.

## Document History

| Version | Date | Purpose |
|---|---|---|
| EV1.0 | Nov. 1999 | First issue of TOM Addendum, Mobile Services Application Note<br>Evaluation Release to Members Only |
| EV1.1 | September 2000 | Evaluation Version Release to Public<br>Updated for comments received |

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## How to comment on the document

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# Section 1 - Overview

Applying the Telcom Operations Map (TOM) for enterprise solutions and process design cannot be viewed as just following a recipe. The TOM provides a framework. As with any framework, it provides high-level information. Additional detail is necessary to support building enterprise processes and solutions.

Mannesmann Mobilfunk, along with other Mobile Service Providers, have found the TOM to be the best in class operations management framework. The TM Forum Mobile Management working team has validated that the TOM framework can be a very helpful tool for Mobiile Networks. However, in working with the TOM outside TM Forum (e.g., discussions with ETSI TMN5), Mannesmann Mobilfunk found that application of the Telecom Operations Map requires more explanatory material to guide understanding and application of the TOM. The three examples in this Application Note are examples from a Mobile Service Provider perspective, but can be applied more broadly. These examples will be further modified and enhanced by TM Forum working teams through this or other documents.

## Process Views

As described in Telecom Operations Map (TOM) Version 2.0, there are multiple dimensions of operations management. Correspondingly there are multiple views that may need to be considered in applying the Telecom Operations Map. When using the Map, it can be viewed from the following perspectives:

- Business Process Framework View (Figure 1 below and the associated input-output diagrams described in the TOM)
- Business Management Views
  - End-to-End Process Flows: Fulfillment, Assurance and Billing Flows
  - Service or Technology Specific (e.g., Broadband, IP, Mobile/Wireless) Views of Process
  - Business Management sub-process or use case views
  - Functional sub-process views (e.g. testing activities)
  - Information Exchange Views
  - Business Relationships of Service Provider with Suppliers and/or other Providers
- Systems/Application and Data Architecture View that supports the Business Processes

These views each provide a representation of necessary processes or sub-processes. They are the depth and detail behind the TOM framework for a Service Provider to provide information and communications services. The beauty of the TOM framework is its simplicity and its ability to be used to represent the complexity of supporting multiple services, technologies and requirements. The examples in this TOM Application Note contribute in 3 ways:

- By providing more explanatory material on application of the TOM.
- By providing a view of specific sub-processes or areas developed from a Mobile Services perspective.
- By providing base input in these areas to update the TOM.

As discussed, three process views will be addressed in this Application Note, i.e., Performance Management, Fraud Management and Roaming Agreement Management. The Performance Management view is closely related to the Service Level Agreement (SLA) Management Process discussed in TOM 2.0. Roaming Agreement Management is very much related to management of bilateral agreements. Fraud Management in the TOM is not much more than a footnote reference at this time.

## Document Structure

The structure of this document is as follows:

Section 1 provides background and document information.

Section 2 provides a numbering scheme for the TOM processes to have a quick way in this document to reference a particular TOM process.

A Performance Management view is presented in Section 3.

Sections 5 and 6 describe typical information flows in a TOM context for Mobile Networks, Roaming Agreement Management and then Fraud Management.

## TOM Business Process Framework

The TOM framework is shown in Figure 1. The examples in this TOM Application Note use this framework to identify the management processes belonging to a business management view and the information flows required to support specific management tasks.

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## Numbering Scheme

To make it easy to reference the Telecom Operations Map processes and the interfaces between them, the numbering scheme in Figure 1 is used in this document.

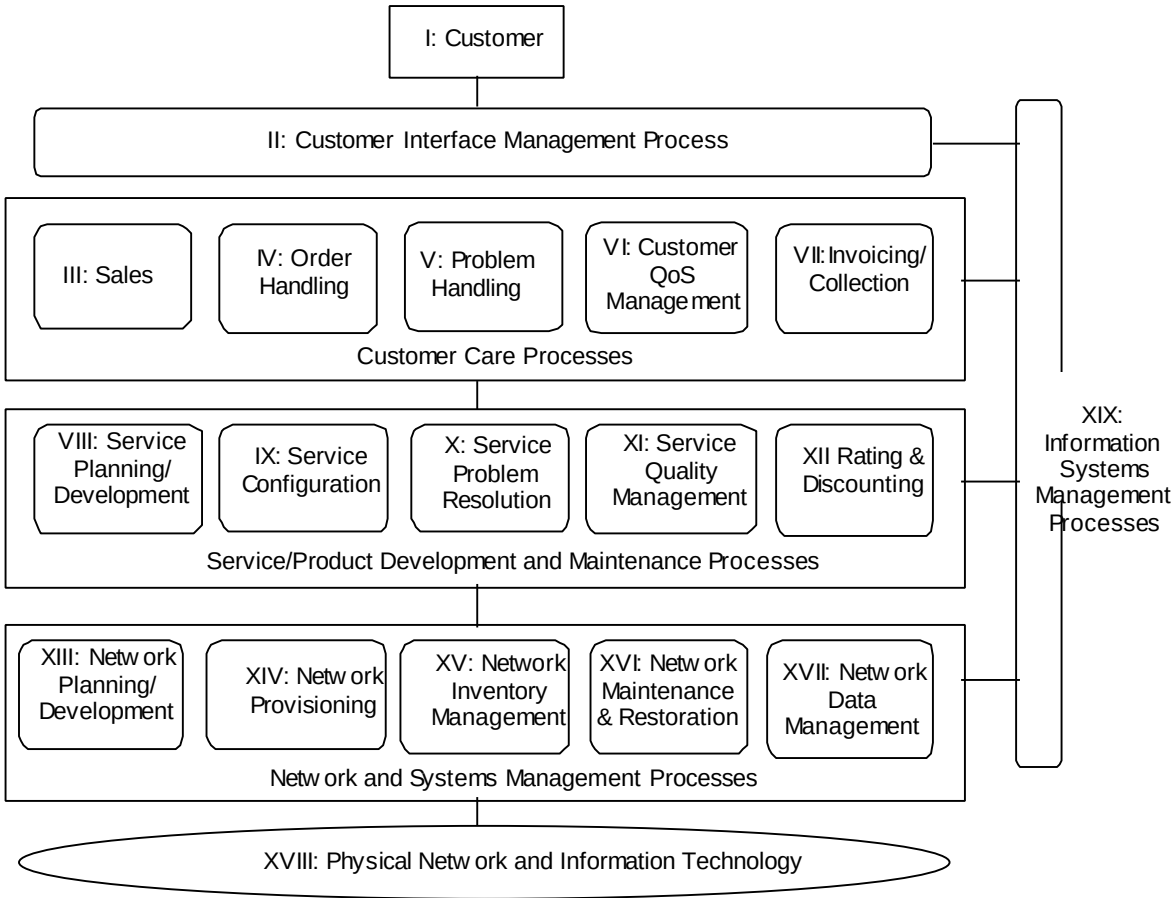


**Figure 1: TOM Framework: Application Note Reference Numbering Scheme**

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# Section 2 - Performance Management

All processes described by the spider diagrams in the Telecom Operations Map usually have functions and/or interfaces in several management and process areas. An initial view of Performance Management is shown in Figure 2.0. It decomposes Performance Management processes to identify essential information flows. It shows a slice through the Telecom Operations Map from a Performance Management point of view. This slice is applicable to Mobile Networks and other networks. Although the "slice" or view is quite large, it does not contain all interfaces or process activities that are related to Performance Management. It does however show the main processes and interfaces involved in Performance Management.

To illustrate the relationship of the interfaces to Performance Management, solid and dotted lines are used in the diagram. The solid lines depict direct performance management support and reporting interfaces. The dotted lines depict interfaces that support performance analysis, management and reporting. Keep in mind that this is not a trouble report management or Problem Handling process flow or set of interfaces.

Key Performance Management use cases associated with the various lines are as follows:

- Customer complains about performance and the complaint is resolved.
- Ad-hoc requests for network performance and service performance data are provided.
- Customer QoS is evaluated based on collected performance data and scheduled reports are issued.
- Network Activities and Status are made available for assessing Customer QoS.
- The network and systems are configured to support an SLA associated with a service request.

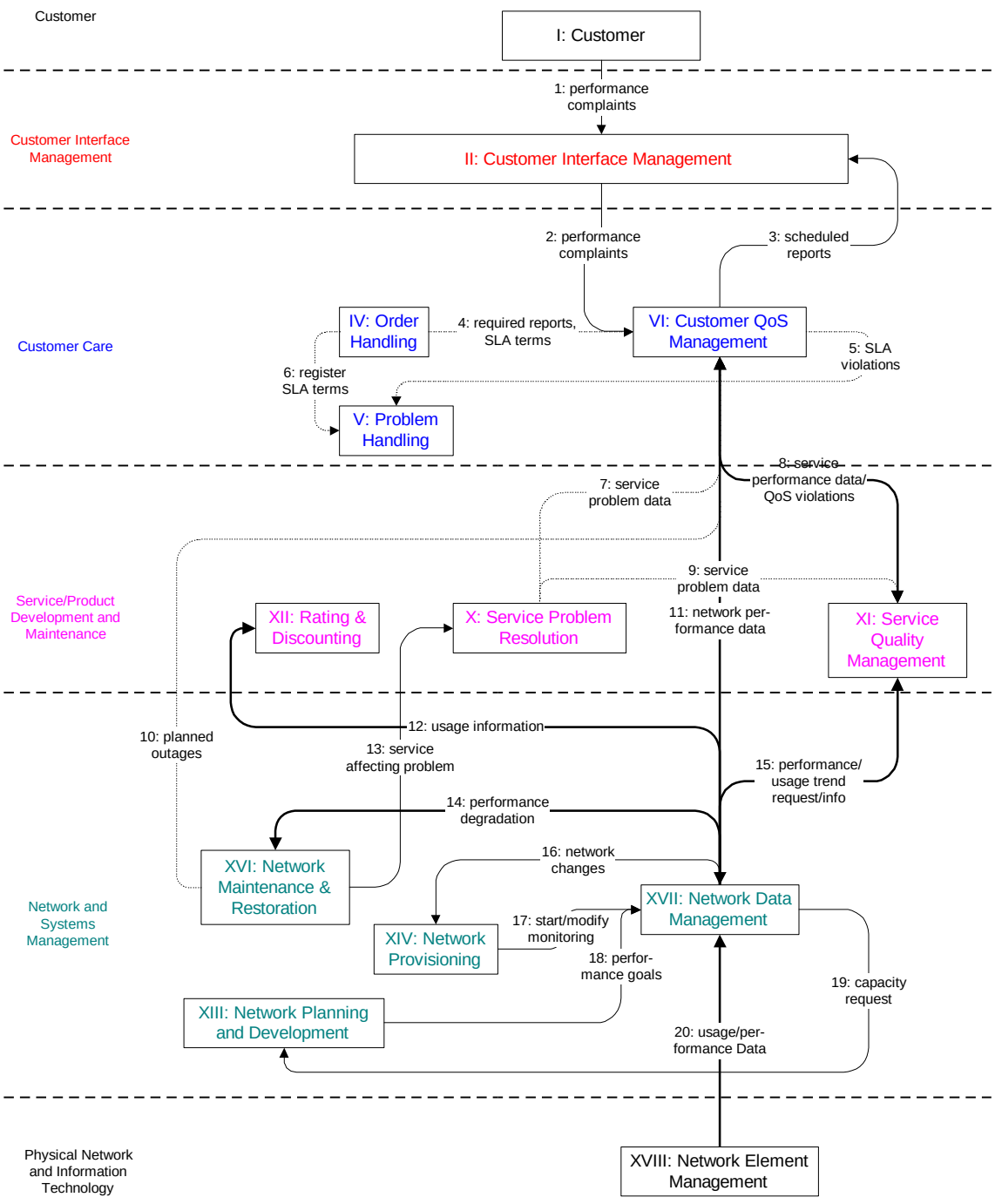


**Figure 2: Performance Management TOM Decomposition Example**


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# Section 3 - Roaming Agreement Management

This example describes information flows central to mobile service and network management. Other services, such as Global Intranet Service, provide support for capabilities similar to the roaming capabilities of Mobile Networks. The concepts presented here can be applied in relation to these types of service capabilities.

## Mobile Services Network Roaming Definition

Roaming is a service provided by Mobile Service Providers. Customers of a Home Service Provider may use the infrastructure of another, a Serving Service Provider (see Figure 3) to give its customer the ability to make calls when outside the home service provider's territory. The goal is to have a customer receive the same service (or as close to the same service) when traveling in an area supported by another network as the customer receives when in their home service provider's area.

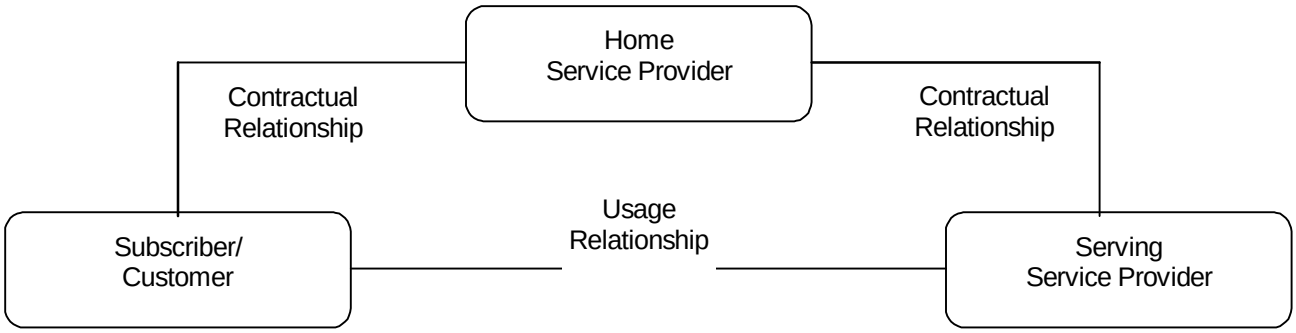


**Figure 3: Relationships between Subscriber, Home and Serving Service Provider**

## Roaming Agreements

To allow a subscriber to use service on a non-Home Service Provider Network, the home service provider and the serving service provider need a contractual relationship called a Roaming Agreement. The Roaming Agreement can be a direct

(bilateral) agreement between two service providers or it can be established by means of a clearinghouse. The home service provider is the customer for the roaming agreement and the serving service provider is the supplier.

Whether as bilateral contract or a contract with a clearinghouse, the Roaming Agreement regulates at least the following items:

- Tariff and pricing
- Signaling and traffic interconnection
- Call Detail Record (CDR) exchange format and exchange schedule
- Problem handling

Today's mobile networks have Roaming Agreements with tens of other networks. With 3rd Generation mobile networks coming, this number is expected to increase to hundreds, if not more. Roaming Agreements impact many areas in the network and operations management infrastructure.

## Roaming Agreement Development and Management Information Flows

The handling of this complex process requires an excellent understanding of Roaming Agreement Development and Management. Figure 4 depicts the essential information flows for supporting Roaming Agreement Development and Management. Information flows which are not effected and/or not changed by Roaming Agreement Management have been omitted to improve readability.

The process or rather information flow depicted in Figure 4 is in the context of the TOM for a new or updated service, as well as a standard offer. Most mobile service operators have a standard set of terms for roaming agreements with other providers. The development of new service options or complex updates is likely to be managed through a Service Development project team. As mentioned above, Mobile Service Providers must manage a large and growing volume of roaming agreements to support their customers. Establishing and executing a new agreement or updates to an existing agreement within two providers' capability set in a fast and automated fashion is crucial to providers being able to:

- Rapidly expand the coverage they offer to their customers or subscribers
- Managing the cost associated with implementing and supporting agreements

Due to the need to handle high volumes of roaming agreements, the emphasis in Figure 4 is on the information flow, which illustrates the *flow of management information* required to support roaming in 3rd Generation networks.

The Roaming Agreement Management information flow can be viewed as an overlay to the main information flow of a serving mobile provider to support it's own

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subscribers. This overlay information flow of the serving service provider is triggered by the roaming customer's request to establish or update a roaming agreement. The roaming customer is a home service provider (not the customers of the home service provider!) who would like to offer roaming capabilities to its subscribers on the network of another service provider. Some notes for clarity:

- The Home Service Provider is making the request of a Serving Service Provider to expand their reach and/or to enhance an existing roaming arrangement.
- The Home Service Provider is the customer. The Serving Service Provider is the supplier.
- The Home Service Provider expectation is a supplier relationship. Therefore, the TOM shown in Figure 4 represents the TOM or operations management of the Serving Service Provider.
- Depending on the service providers' volumes and requirements, automation of this supply chain may be essential.

Figure 4 shows the three essential information flow aspects for the Serving Service Provider:

- Customer request for support through Customer Care processes
- New service or option development and implementation through Service Planning and Development processes
- Ongoing management of the Roaming Agreement across the Operations Management infrastructure

To differentiate the major and optional information flows of roaming agreement management solid and dotted lines are used in Figure 4 as follows:

### Customer Care information flow – solid line.

This is the major information flow supporting all contract related activities, including initiating tariff negotiations, negotiating SLAs, trouble handling procedures, roaming accounting file exchange, etc. for basic or standard agreements. Depending on the service provider's processes and business rules, Customer Care will involve Business Management Layer and other Operations Management processes.

### New service capability information flow – dash-dotted line.

This is an optional supporting flow which takes place if the support of a roaming agreement requires:

- the introduction of a new agreement
- the introduction of new services or service options
- a configuration change of existing services

## New network facilities information flow--dashed line.

This is an optional supporting flow which takes place if the support of an roaming agreement requires the introduction of new network facilities or a configuration change of existing network facilities.

Again, depending on the Service Provider, the requirements for involving Service Planning and Development will vary based on their business rules and processes.

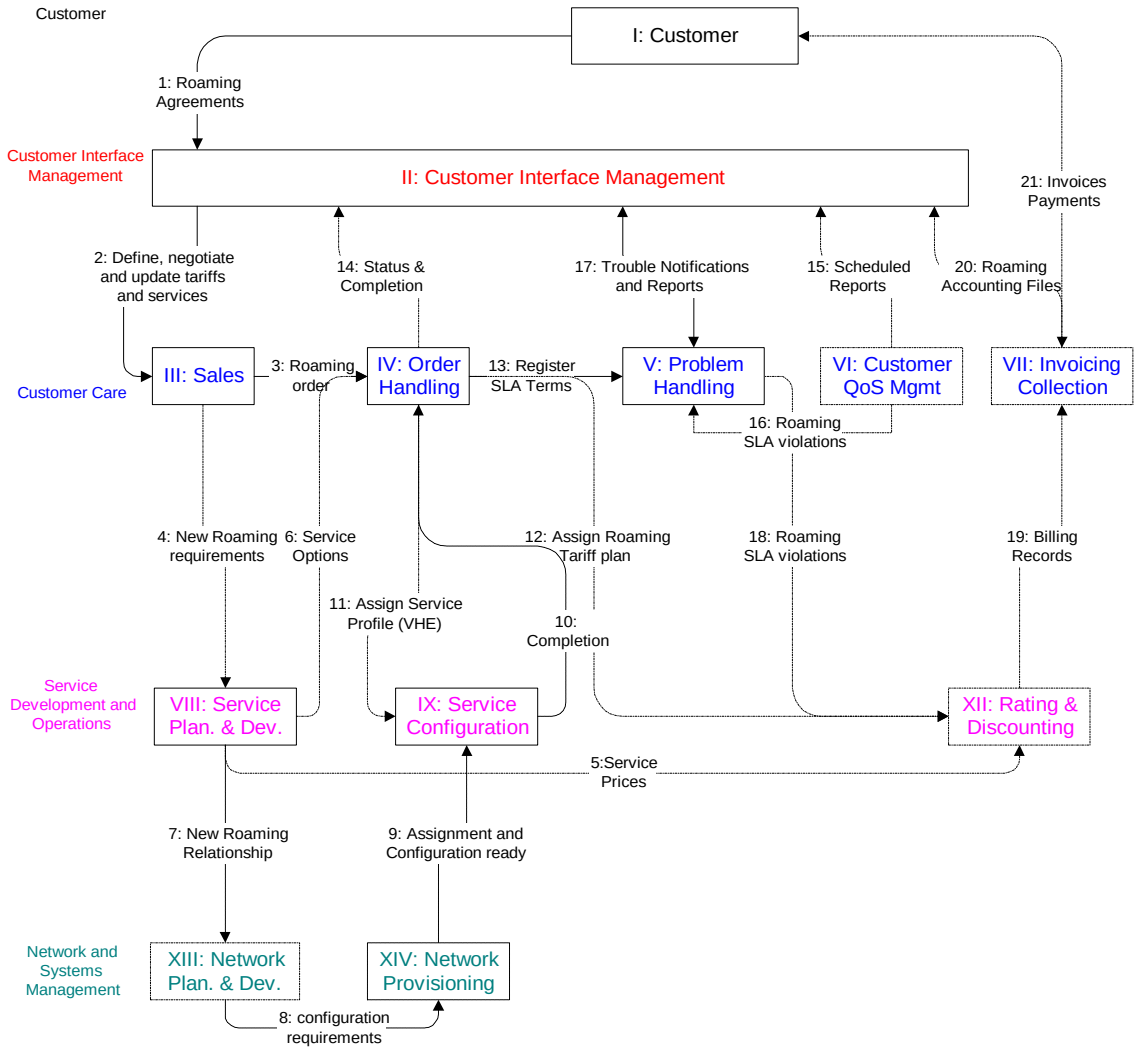


**Figure 4: Roaming Agreement Management Information Flow Example**

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## Fulfillment:

1. Roaming agreement request information from a roaming customer (a home service provider) for a new roaming agreement or an update to an existing roaming agreement.

2. Roaming agreement requirements information to Sales. If the required service capabilities are standard offers/arrangements for the serving service provider, Sales defines, negotiates and updates tariffs between the home service provider and serving service provider resulting in a roaming order. Sales utilize defined Business Management Layer and Operations Management support and processes to respond to customer.

3. Roaming agreement request information to Order Handling. Order Handling maintains the internal workflow of the serving service provider required to assign and configure all needed resources to support the new or updated roaming agreement.

4. Sales passes new or changed roaming (service) requirements information to the Service Planning and Development Process for analysis and business case decision, if:

   - Existing serving service provider service capabilities are not sufficient
   - It is a new Roaming relationship for the service providers
   - There are new requirements not currently offered by the serving service provider

Service Planning and Development designs, develops, deploys and implements based on the business decision to provide. Service Planning and Development involves or passes:

5. New service or option information to Rating and Discounting processes for development or update.

6. Service changes or new service option information to Order Handling Process for development or update of Order Handling processes and systems.

7. Network requirements information to Network Planning and Development, if the implementation of the new or updated service requires network changes (e.g. establishment of a new signaling link, etc.). Although not shown here for simplicity, there may be Problem Handling process or Customer QoS process requirements to support the new or updated service or service options. Interaction is required from Service Development to almost any process of the TOM to assess and support impacts of new requirements. Appropriate processes need to be involved with development or receive updates to support the new service or option.

8. Network Configuration change information required by the new or updated roaming requirements are passed to Network Provisioning.

9. Network Provisioning communicates to Service Configuration Process assignment and configuration readiness information. This can reflect work as simple as a test and turn-up, up to a more complex implementation that would end with Network Validation Test.

10. Service Configuration reports completion information for the network and service configuration to Order Handling.

11. Order Handling assigns the most suitable service profile (Virtual Home Environment - VHE):

12. Assigns the roaming tariff plan and passes information to Rating and Discounting

13. Registers the SLA terms for the new roaming relationship and provides to Problem Handling and Customer QoS processes.

14. Finally, Order Handling reports completion of the establishment or update of the roaming relationship to the customer.

### Assurance

15. Customer QoS Management compiles service performance reports, negotiated in the roaming agreement, and provides them to the customer through Customer Interface Management.

16. If Customer QoS Management detects a violation of a negotiated SLA, it provides violation information to the Problem Handling process.

17. Troubles occurring during roaming service execution will be exchanged in notifications and reports.

18. Detection information for roaming SLA violations is reported to the Rating and Discounting process.

### Billing

19. Rating and Discounting generates billing records to the Invoicing and Collections process.

20. These billing records are collected in roaming accounting file

21. Invoicing and Collections processes records into invoices that are provided to the customer, the home service provider.

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# Section 4 - Fraud Management

Fraud and all the activities to detect and prevent fraud are quite common to any network. Nonetheless, mobility and roaming, two integral mobile services, make fraud detection and fraud prevention more complicated and more urgent.

The mobile service provider does not know the location of the ”end of the wire,” which would lead to the home of a fraudulent customer. For roaming, the situation is demonstrably worse. For a roaming visitor the caller is not the service provider’s customer and therefore, the service provider does not have complete information to assess fraud. In the reverse case, the service provider has little control when its customers are roaming, e.g., potentially going over credit limits or using service after being suspended. In this case, the fraudulent customer uses the network facilities of another provider (the serving service provider) meaning the home service provider has to rely on the serving service provider for some level of fraud protection support. This means to a large extent that fraud prevention is largely out of the control of the home service provider when one of its customers roams on another network and out of the control of a serving service provider when being visited by another provider’s roamer.

Typically fraud management in mobile networks (i.e. fraud detection and prevention) includes at least the following functions:

- Classification of customers according to levels of fraud risk (based on demographic and credit information)
- Revision of the fraud risk level (based on usage information, payment behavior, etc.--near real time or off-line)
- Detection of fraud patterns (in real time or near real time)
- Taking the appropriate actions to suspend service, even if the customer is using a different network than its home network (the customer is roaming)
- For visiting customers (i.e., roamers), a serving service provider may consult the home provider and/or international repositories to assess fraud to determine whether to allow access by that roamer (e.g. the Central Equipment Identity Register – CEIR for GSM mobile equipment)

Fraud management activities are required in several processes of the Telecom Operations Map. Figure 5 shows the occurrence of fraud detection and fraud prevention functions listed above to the existing processes of the Telecom Operations Map. All information flows not effected and/or not changed by fraud management have been omitted to improve readability.

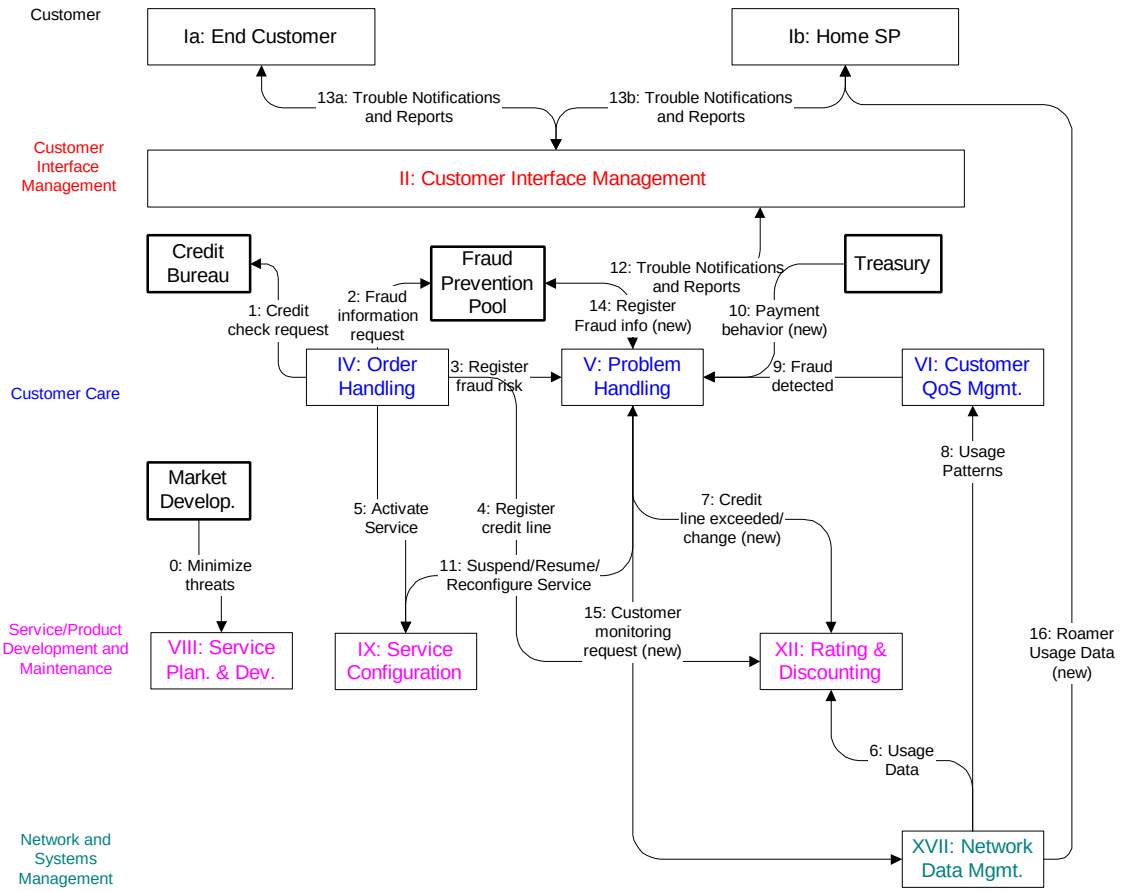


**Figure 5: Information flow to support Fraud Management**

Fraud management is also a bit more difficult because it consists of many process flow segments instead of one or two continuous process flows. This characteristic also makes it difficult to easily represent fraud management on the TOM. Although it seems that all required functions to support fraud management exist in the Telecom Operations Map, fraud management may require introduction of some new interfaces (marked accordingly in figure 5) to be efficient.

## Pre service/Service Planning, Design and Development: prevent fraud

(0) Potential threats and leaks should be analyzed during Service Planning and Design and the service should be optimized to be as resistant to fraud threats as possible.

## Fulfillment: prevent fraud

Upon receipt of a service request, Order Handling initiates the classification of customers according to levels of fraud risk. This includes:

1. A credit check request

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2. A retrieval of fraud information from a fraud prevention pool (if available)

3. Registering the determined initial fraud risk level with the Problem Handling process

4. Establishing a credit line based on the customer's fraud risk level with the Rating and Discounting process

5. Finally, the ordered service will be activated fully or partially based on the fraud risk level.

### Assurance 1: detect fraud

6. Normal usage data (preferably hot billing usage data—real time) is transferred to the Rating and Discounting process.

7. Rating & Discounting checks billing records for exceeding established credit lines and reports this to the Problem Handling process (new) for handling per the service provider's business rules.

### Assurance 2: detect fraud

8. Usage data/patterns are sent to the Customer QoS Management process for analysis.

9. If the Customer QoS Management process detects fraud, it sends a notification to the Problem Handling process, which based on the service provider's business rules, determines appropriate actions to prevent or stop fraud.

### Assurance 3: detect fraud

10. Treasury, Accounting or Billing Collections support (depending on service provider's specific processes) informs the Problem Handling process of the payment behavior of customers for action per the service provider's business rules.

### Assurance 4: stop fraud

11. Problem Handling takes appropriate actions based on the service provider's business rules to prevent or stop fraud by;

12. Reconfiguring the service

13. Contacting the customer (either the end-customer or the home service provider in case of a roaming user)

### Assurance 5: prevent fraud

14. Problem Handling may register new or updated fraud information in the Fraud Prevention Pool.

### Assurance 6: stop roaming fraud

15. Problem Handling requests the monitoring of a visiting customer on a trouble notification request to the particular home service provider according to the roaming agreement.

16. Network Data Management delivers usage data to the requesting home service provider per the procedures in the roaming agreement.

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# Summary

This Application Note provides additional detail associated with Performance Management, Roaming Agreement Management and Fraud Management. The descriptions provide additional guidance to the users of the TOM. It is key work, since the TM Forum will be able to use this Application Note as a strong base to adjust, enhance and augment the TOM:

- For a common view of Performance Management interfaces across TM Forum working teams.
- For modeling of Roaming Agreement Management and Fraud Management processes in the TOM.

In addition, it is expected that recent work with the Service Quality Management Process will provide new input to update Performance Management. The Application Note will also initiate more member dialog in these areas.

This Application Note was one of the impetuses for the TM Forum to procure and use a process modeling tool.

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# References

## Reference List

TeleManagement Forum Telecom Operations Map, NMF, GB910, Evaluation Version 2.0, November 1999

ITU-T TMN Recommendation M.3400 (TMN Management Functions, ITU-T, 4/97), M.3010 (Principles for a telecommunication management network, ITU-T), M.3200 (TMN Management Services, ITU-T, 1996) and Related Recommendations

GR-2869-CORE, Telcordia Technologies Generic Requirements for Operations Based Telecommunications Management Network (TMN) Architecture